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14. ABSTRACT

This goal of this project is to develop a large-scale, longitudinal registry of PTSD in combat-exposed OIF/OEF/OND male and female veterans. The objective of the current study is to systematically expand the longitudinal assessment by collecting follow-up data at additional time points for multiple domains of interest. Patterns of longitudinal change in the VALOR cohort will be empirically classified into trajectory subtypes by means of latent growth mixture modeling. The availability of comprehensive data on PTSD symptoms and related exposures and outcomes at multiple time points in a cohort of VA users with and without PTSD provide a unique opportunity to examine a number of hypotheses regarding longitudinal trajectories in combat-exposed veterans. In addition, the large proportion of women in our sample will allow us to examine variation in the associations by gender.

15. SUBJECT TERMS

Risk factors for PTSD, PTSD symptom development, VA healthcare utilization.

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1. **INTRODUCTION:**

Project VALOR is a large-scale, longitudinal registry of PTSD in combat-exposed OIF/OEF/OND male and female veterans. The objective of the current study is to systematically expand the longitudinal assessment by collecting follow-up data at additional time points for multiple domains of interest. Patterns of longitudinal change in the VALOR cohort will be empirically classified into trajectory subtypes by means of latent growth mixture modeling. The availability of comprehensive data on PTSD symptoms, related exposures, and outcomes at multiple time points in a cohort of VA users with and without PTSD provides a unique opportunity to examine a number of hypotheses regarding longitudinal trajectories in combat-exposed veterans. In addition, the large proportion of women in our sample will allow us to examine variation in the associations by gender.

Using baseline and follow-up data from participants in Project VALOR, we will evaluate the following specific aims:

1. Examine trajectories of PTSD symptomatology and diagnosis by chart and diagnostic interview assessments in combat-exposed men and women.
2. Examine the nature and extent of military sexual trauma (MST) in combat-exposed men and women who have utilized the VA Healthcare System, including the contribution of MST to PTSD symptoms and diagnosis.
3. Examine associations of PTSD, mTBI, major depressive disorder (MDD), and treatment utilization in relation to changes in suicidal ideation.

2. **KEYWORDS:**

Post-traumatic stress disorder (PTSD), military sexual trauma (MST), suicide, combat-exposed veterans, PTSD trajectory, longitudinal, VA treatment utilization

3. **OVERALL PROJECT SUMMARY:**

In quarter one of this year, 1453 participants were consented to participate in the study and 411 subjects completed their participation in the second phase (consisting of an online questionnaire). By the end of quarter two, a total of 1453 subjects were consented to participate and 1003 subjects had completed the study. At the end of quarter three, a total of 1473 participants were consented and 1273 subjects had completed the study. In quarter four, we completed the second round of data collection. Out of the total Project VALOR sample (n=1649), 1526 participants (92.5%) were consented for participation and 1347 participants (81.7%) completed their participation in the second phase of the study. In total, 56 participants (3.3% of the sample) declined to participate in the study. To date, all of the data from the second round of data collection has been entered and we are in the process of cleaning that data for use in future analyses. In September of 2015, we started recruitment for the third round of data collection. To date, 52 participants have agreed to participate. A total of 339 participants have completed their online questionnaire and 284 have completed their phone interview in the third round of data collection.

We also continue to make progress on other aspects of the project. For quality assurance, assessors attend weekly reliability meetings in which they review a sample of completed interviews. Additionally, we are continuing the process of abstracting EMR data and merging it with both round 3 phase 2 data and phase 3

data. Further, both VA and NERI personnel are actively working to de-identify data and transfer it to NERI as it is collected so it can be appropriately cleaned and made available for subsequent analyses. NERI personnel have made trips to the VA to streamline this process. In particular, NERI personnel download the datasets once data collection is completed at each time point. Once the datasets are downloaded, the data is coded and checked for accuracy. Once coding is completed, data sets are pulled from the study data and VINCI data based on the needs of each individual paper.

Interim analyses using data collected during the three rounds of phase 2 are ongoing. To date, a number of projects which are in line with study aims have been presented to an international audience at a range of conferences. Each of these projects has involved a combination of data collected via self-report, interview, and/or the EMR.

Although we are not able to study our first goal of examining the trajectories of PTSD symptomatology and diagnosis in full as of yet (this requires that we complete data collection at all three phases), we have conducted interim analyses to better understand how PTSD affects other outcomes across time. For example, our interim analyses have provided insight into how psychopathology affects employment in our sample longitudinally; how different types of combat affect rates of PTSD; factors that influence treatment seeking behaviors; and how Veterans with unique presentations of PTSD (e.g., dissociative subtype; subthreshold PTSD) differ from those with a more traditional diagnosis.

Our second aim is to examine the nature and extent of military sexual trauma (MST) in combat-exposed men and women who have utilized the VA Healthcare System, including the contribution of MST to PTSD symptoms and diagnosis. We have made excellent progress on this goal in our interim analyses, finding and presenting research which elucidates how sex differences manifest in MST-reporting based on the type of assessment used; how MST influences social support; and rates of MST in the LGBQ community.

Through interim analyses, we have also made progress on our third aim, which is to examine associations of PTSD, mTBI, major depressive disorder (MDD), and treatment utilization in relation to changes in suicidal ideation. We have presented the results of our findings at various conferences. These results provide information about potential risk factors for suicidal behaviors (which include sleep disturbances and MDD); how functional impairment and anger interact with suicide risk; and how effective safety plans are at reducing risk of suicidality. The presentations associated with the interim analyses for all three aims are listed in section 6 of this document. Further, a selection of these presentations is attached to this report.

We are beginning to formulate research questions that the phase 3 data can answer beyond those proposed, and we are planning to conduct analyses and to present the results of these in future presentations and publications. Our last scientific advisory board meeting (SAB) was held in December of 2014. Since then, the team has been in regular contact with key members of the advisory

board who have been briefed on interim research findings. We are currently in the process of setting up another formal advisory board meeting for this summer.

4. **KEY RESEARCH ACCOMPLISHMENTS:**
   Nothing to report.

5. **CONCLUSION:**
   The PTSD registry will provide information to assist researchers, military leaders, and treatment providers to better understand PTSD and related problems, with a specific focus on the course of the disease, suicidal ideation, and military sexual trauma. This knowledge will be of benefit to health care providers, policy makers and current service members as well as victims of trauma in the broader community. It will include:
   • Evaluation of long-term outcomes of PTSD;
   • A more accurate assessment of current theoretical models of symptom development, and;
   • Documentation of health resource utilization and development of a database that will serve as a resource for health services planning and policy.

   Furthermore, this study will contribute:
   • The formation of a potential cohort of subjects for ancillary studies, ranging from genomic influences to quality of life and psychosocial outcomes, as well as future clinical trials;
   • The creation of a representative sample of PTSD OEF/OIF/OND Veterans who use the VA medical system available for use in epidemiologic studies, particularly for comparisons with active duty and other Veteran or civilian populations;
   • Utility to clinicians, patient advocacy groups, and health policy planners;
   • Publications and dissemination of the registry results to provide a representative perspective of what is achieved in actual current care settings, thereby augmenting outcomes data from clinical trials.

6. **PUBLICATIONS, ABSTRACTS, AND PRESENTATIONS:**

PUBLICATIONS

Holowka, D. W., Marx, B. P., Gates, M. A., Litman, H. J., Ranganathan, G., Rosen, R. C., & Keane, T. M. (2014). PTSD diagnostic validity in Veterans Affairs electronic records of Iraq and Afghanistan veterans. Journal of consulting and clinical psychology, 82(4), 569.

PRESENTATIONS

Barretto, K.M., Clark, J.B., Black, S.K., Kearns, J.C., Green, J.D., Marx, B.P. (2015). *A longitudinal examination of sleep disturbance, depression and suicide risk in Operation Enduring Freedom (OEF) & Operation Iraqi Freedom (OIF) Veterans.* Poster presented at the Anxiety and depression Association of America 35th Annual Meeting, Miami, FL.

Barretto, K.M., Clark, J.B., Black, S.K., Bovin, M.J., Marx, B.P., Rosen, R.C., & Keane, T.M. (2015). *Sex differences between self-report and clinician-assessed Military Sexual Trauma (MST) in Operation Enduring Freedom (OEF) & Operation Iraqi*

Freedom (OIF) Veterans. Poster presented at the 49th Annual Meeting of the Association of Behavioral and Cognitive Therapies, Chicago, IL.

Bovin, M. J., Marx, B. P., Black, S. K., Barretto, K. M., Schnurr, P. P., Rosen, R. C., & Keane, T. M. (2015). *Understanding employment status longitudinally in returning Veterans*. Poster presented at the International Society for Traumatic Stress Studies 31st Annual Meeting. New Orleans, LA.

Bovin, M. J., Black, S. K., Erb, S. E., Street, A., Marx, B. P., Rosen, R. C., & Keane, T. M. (2015). *Reports of military sexual trauma among returning Veterans: Who are we missing?* Poster presented at the International Society for Traumatic Stress Studies 31st Annual Meeting. New Orleans, LA.

Black, S. K., Erb, S. Bovin, M. J., Green, J., Marx, B. P., Rosen, R. C., & Keane, T. M. (2015). *Screening of military sexual trauma: Preventing missed screenings*. Poster presented at the International Society for Traumatic Stress Studies 31st Annual Meeting. New Orleans, LA.

Erb, S., Bovin, M.J., Annunziata, A., Marx, B.P., Rose, R.C., Keane, T.M. (2015). *The Impact of Demographic Variables, Comorbid Diagnoses, Psychosocial Impairment, and Service Connected Status on Psychotherapy Utilization among Veterans Diagnosed with PTSD.* Posted presented at the Military Health System Research Symposium, Ft. Lauderdale, FL.

Erb, S., Bovin, M. J., Black, S. K., Marx, B. P., Rosen, R. C., & Keane, T. M. (November 2015). *Implications of lower levels of social support in OIF/OEF Veterans with military sexual trauma*. Poster presented at the International Society for Traumatic Stress Studies 31st Annual Meeting. New Orleans, LA.

Erb, S., Green, J.D., Bovin, M.J., Marx, B.P., Keane, T.M., Rosen, R.C. (2015). The effect of combat on PTSD Prevalence Rates*: A comparison of Operation Iraqi Freedom Deployment Phases.* Poster presented at the 49th Annual Meeting of the Association of Behavioral and Cognitive Therapies, Chicago, IL.

Green, J.D., Bovin, M.J., Kearns, J.C., Black, S.K., Marx, B.P., Rosen, R.C., Keane, T.M. (2015). *Longitudinal Association of Functional Impairment and Suicide Risk on OEF/OIF Veterans.* Presentation at the Anxiety and Depression Association of America 35th Annual Meeting, Miami, FL.

Green, J.D., Marx, B.P., Bovin, M.J., Rosen, R.C., Keane, T.M. (2015). *Veterans' Barriers to Help Seeking: Relationship Between Sex and Mental Health Service Utilization.* Presentation at the 123rd Convention of the American Psychological Association, Toronto, Ontario, Canada.

Green, J.D., Jackson, C., Kearns, J.C., Black, S.K., Marx, B.P., Rose, R.C., Kean, T.M. (2015). *Evaluating the Effects of Safety Plans and High Risk for Suicide Flags on Suicide Risk and Related outcomes in Operation Enduring Freedom and Operation Iraqi Freedom Veterans.* Poster presentated at the Military Health System Research Symposium, Ft. Lauderdale, FL.

Green, J.D., Bovin, M.J., Marx, B.P., Rosen, R.C., Keane, T.M. (2015). *Longitudinal Predictors of Help-Seeking Behaviors in OEF/OIF/OND Veterans.* Presentation at the 49th Annual Meeting of the Association of Behavioral and Cognitive Therapies, Chicago, IL.

Green, J.D., Bovin, M.J., Wolf, E., Annunziata, A., Marx, B.P., Rosen, R.C., Keane, T.M., (2015). *Risk Factors and Correlates of the PTSD Dissociative Subtype.* Presentation at the 49th Annual Meeting of the Association of Behavioral and Cognitive Therapies, Chicago, IL.

Gorman, K.R., Kearns, J.C., Green, J.D., Marx, B.P., Rosen, R.C., & Keane, T.M. (2015). *Prevalence Rates of Military Sexual Trauma in a Sample of LGBQ*

Combat-Exposed Veterans. Poster presented at the International Society for Traumatic Stress Studies 31st Annual Meeting, New Orleans, LA.

Kearns, J.C., Gorman, K.R., Green, J.D., & Marx, B.P. (2015). *Anger and Suicide Risk in a National Sample of Combat-Exposed Veteran.* Poster presented at the 49th Annual Meeting of the Association of Behavioral and Cognitive Therapies, Chicago, IL.

Klein, A., Moshier, S., Parker-Guilbert, K., Bovin, M. J., Schnurr, P. P., Friedman, M. J., Rosen, R. C., Keane, T. M., & Marx, B. P. (April 2016). *Subthreshold DSM-5 posttraumatic stress disorder among a sample of veterans*. Poster to be presented at the Anxiety and Depression Association of America 36th Annual Meeting. Philadelphia, PA.

7. **INVENTIONS, PATENTS AND LICENSES:**

Nothing to report

8. **REPORTABLE OUTCOMES:**

Holowka and colleagues (2014) examined whether posttraumatic stress disorder (PTSD) diagnostic status as listed within the Department of Veteran Affairs (VA) electronic databases were concordant with PTSD diagnostic status as determined by a standardized diagnostic interview. Participants provided consent to access their electronic medical records (EMRs) and completed interview-based and self-report measures of psychopathology. The PTSD Module of the Structured Clinical Interview for DSM-IV (SCID) was used to assess PTSD diagnosis. Concordance between EMR diagnosis and SCID diagnosis was 72.3% for current PTSD and 79.4% for lifetime PTSD. Associations were observed between concordance status and combat exposure, PTSD symptom presentation, comorbid anxiety and depression, and psychosocial impairment. Veterans who were false negatives (PTSD on the SCID but not in the EMR) were more likely to report lower levels of combat exposure, panic, and PTSD avoidance symptoms. Veterans who were false positives (PTSD in the EMR but not on the SCID) were more likely to report treatment seeking for emotional problems and less overall functional impairment. Overall, those individuals with the most and least severe symptom presentations in the diagnostic interview were more likely to be accurately classified.

9. **OTHER ACHIEVEMENTS:**

Based upon work supported by this award, a funding request from the Patient Safety Center of Inquiry on Suicide Prevention (PSCI-SP) was granted to improve patient safety for Veterans and VHA. This project is now complete and efforts are being made to create a resource book using study results to extend instructions in the Suicide Prevention Coordinator Training Manual (Stanley & Brown, 2008). This resource book will outline empirically-supported ways in which safety plans (written lists of warning signs of an impending suicidal crisis and proposed coping strategies for managing the crisis; Stanley & Brown, 2011) can be improved.

10. **REFERENCES**

N/A

11. **APPNDICES**

Attached

Project VALOR: Trajectories of Change in PTSD in Combat-Exposed Veterans
Quarterly Report
W81XWH-12-2-0117

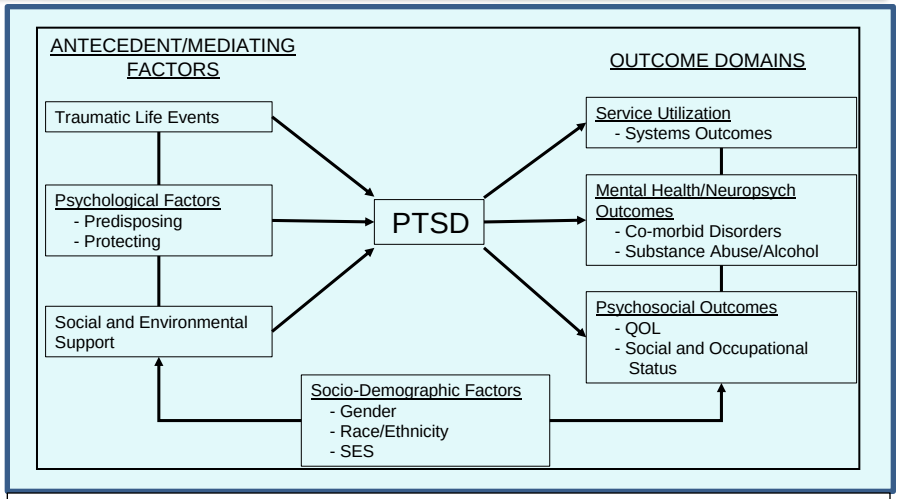
PI: Terence M. Keane, PhD **Org**: VA Boston Healthcare System **Award Amount:** $3,295,994

Study/Product Aim(s)

- Examine trajectories of PTSD symptomatology and diagnosis by medical chart abstractions and diagnostic interview assessments in combat-exposed men and women.
- Examine the nature and extent of military sexual trauma (MST) in combat-exposed men and women who have utilized the VA Healthcare System, including the contribution of MST to PTSD symptoms and diagnosis.
- Examine associations of PTSD, mTBI, major depressive disorder (MDD), and treatment utilization in relation to changes in suicidal ideation.

Approach

To develop the first longitudinal registry of combat-exposed men and women with post-traumatic stress disorder (PTSD), 1649 participants from across the country will complete a second follow-up round of online questionnaires, and telephone interviews. We will also have access to our participants' electronic VA medical charts.



Data collection for the third time point began in 09/2015. Analysis of data from VALOR 1 and the first time point of VALOR 2is ongoing.

Timeline and Cost

Activities CY	12	13	14	15
IRB and HRPO Approval				
Data Collection (Rounds 1-3)				
Analysis of Data (Phases 1 and 2)				
Preparation of Dataset for Future Use				
Estimated Budget ($K)	**$759.8**	**$852.5**	**$875.5**	**$808.2**

Updated: 10/8/2015

Goals/Milestones

CY12 Goal – Start Data Collection
☑ Training of study stuff
☑ Continue analysis of data from Valor 1
CY13 Goals – Continue Data Collection
☑ Training of study staff
☑ Continue analysis of data from Valor 1
CY14 Goal – Continue Data Collection
☑ Start collection of Round 2 data
☑ Finish collection of Round 2 data
☑ Start Round 3 data collection
CY15 Goal – Complete Data Collection and Analyze Data
☐ Finish collection of Round 3 data
☐ Continue data analysis and prepare database for future use

Budget Expenditure to Date
Projected Expenditure: $ 2,487,780
Actual Expenditure: $1,712,877

Journal of Consulting and Clinical Psychology

PTSD Diagnostic Validity in Veterans Affairs Electronic Records of Iraq and Afghanistan Veterans

Darren W. Holowka, Brian P. Marx, Margaret A. Gates, Heather J. Litman, Gayatri Ranganathan, Raymond C. Rosen, and Terence M. Keane

Online First Publication, April 14, 2014. http://dx.doi.org/10.1037/a0036347

Journal of Consulting and Clinical Psychology

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PTSD Diagnostic Validity in Veterans Affairs Electronic Records of Iraq and Afghanistan Veterans

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Objective: Administrative planning and policy decisions frequently rely on diagnostic data extracted from large electronic databases. However, the accuracy of this diagnostic information is uncertain. The present study examined the degree to which various diagnoses of posttraumatic stress disorder (PTSD) within Department of Veterans Affairs (VA) electronic databases were concordant with PTSD diagnostic status determined by standardized diagnostic interview. ***Method:*** We interviewed 1,649 veterans of the Iraq and Afghanistan wars using the PTSD Module of the Structured Clinical Interview for *DSM–IV* (SCID). Participants also completed other interview-based and self-report measures of psychopathology and provided consent to access their electronic medical records (EMRs). ***Results:*** Concordance between database diagnosis and SCID diagnosis was 72.3% for current PTSD and 79.4% for lifetime PTSD. We observed associations between concordance status and combat exposure, PTSD symptom presentation, comorbid anxiety and depression, and psychosocial impairment. Veterans with false-negative PTSD diagnoses in the EMR were more likely to report lower levels of combat exposure, panic, and PTSD avoidance symptoms. Veterans with false-positive PTSD diagnoses in the EMR were more likely to report treatment seeking for emotional problems and less overall functional impairment. ***Conclusions:*** Although the majority of participants were concordant for PTSD status, over 25% of EMR diagnoses differed from those obtained in the diagnostic interview, with varying proportions of false positives and false negatives. Overall, those individuals with the most and least severe symptom presentations in the diagnostic interview were more likely to be accurately classified.

Keywords: PTSD, veterans, diagnosis, electronic medical record, electronic health record

During the 1980s, interest in electronic medical record keeping rose steadily, leading to an Institute of Medicine report (IOM; Dick & Steen, 1991) that recommended widespread adoption of computer-based patient records by 2001. This report and a follow-up IOM report (Dick, Steen, & Detmer, 1997) highlighted the emerging information management capabilities that such systems could provide health care organizations. These reports underscored possibilities of improved care and more efficient service delivery and recommended the establishment of an electronic medical record (EMR) that "clearly delineates the patient's clinical problems and the current status of each" (Dick et al., 1997, p. 180). To this day, federal initiatives provide incentives for the adoption of this technology (Blumenthal, 2011), and larger, urban hospitals have widely adopted these tools (Jha et al., 2009), incorporating many common data elements, such as demographics, progress notes, and problem lists. Outside of large urban hospitals, physicians have been slow to adopt EMRs (DesRoches et al., 2008; Ford, Menachemi, Peterson, & Huerta, 2009), even though adopters report improved service quality (Linder, Ma, Bates, Middleton, & Stafford, 2007), efficiency (Chaudhry et al., 2006), and overall satisfaction (DesRoches et al., 2008).

Like other large, contemporary health care systems, the Department of Veterans Affairs (VA) has also adopted an electronic health record system. Referred to as the Veterans Health Information Systems and Technology Architecture (VistA), it is an integrated system of both nationally mandated and locally adapted software applications. VistA use dramatically increased since its

Darren W. Holowka and Brian P. Marx, National Center for PTSD, VA Boston Healthcare System, Boston, Massachusetts, and Department of Psychiatry, Boston University School of Medicine; Margaret A. Gates, Heather J. Litman, Gayatri Ranganathan, and Raymond C. Rosen, New England Research Institutes, Watertown, Massachusetts; Terence M. Keane, National Center for PTSD, VA Boston Healthcare System, Boston, Massachusetts, and Department of Psychiatry, Boston University School of Medicine.

Margaret A. Gates is now at the Department of Epidemiology, University at Albany. Heather J. Litman is now at the Clinical Research Center, Boston Children's Hospital, Boston, Massachusetts.

This research was funded by the Department of Defense, Congressionally Directed Medical Research Program under designations W81XWH-08-2-0100/W81XWH-08-2-0102 and W81XWH-12-2-0117/W81XWH-12-2-0121. Portions of the manuscript were presented at the Annual Conference of the Anxiety and Depression Association of America, La Jolla, California, April 4–7, 2013.

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debut in 1983, and it now includes over 100 applications (S. H. Brown, Lincoln, Groen, & Kolodner, 2003) and has improved the quality of service delivery across the nation (Byrne et al., 2010).

The National Patient Care Database (NPCD) is the VA's centralized database for VistA system data from across the country. It contains patient demographics, electronic health records, data related to the provision of services for administrative and billing purposes, and other information. This database is commonly used by researchers interested in extracting data in mass quantities for the purpose of determining prevalence and correlates of conditions of interest. The Computerized Patient Record System (CPRS) is a user-friendly interface that presents VistA/NPCD data similarly to a paper medical record and is used in clinical settings. Various such applications allow access to data regarding clinical warnings, test results, reports, progress notes, and diagnoses entered by clinicians associated with a particular patient. This large centralized database is compoised of various applications and subsystems that contain diagnostic information.

Encounter records document services rendered to patients, including who provided the service, the date and the condition treated, using *International Classification of Diseases, Ninth Revision* (ICD-9) and *Current Procedural Terminology* codes, which are mandatory for all encounters. The file also includes a *Problem List* for each patient (i.e., a list of ICD-9 diagnoses assigned by health care providers for patients receiving treatment within the VA). It is notable that many of these fields require special attention by the clinician and a deliberate effort to change the record. In practice, it is unclear to what extent the Problem List is monitored or updated after a diagnosis has been entered on this list.

Data from the NPCD are essential for determining the prevalence and correlates of posttraumatic stress disorder (PTSD) and other mental disorders among Iraq and Afghanistan war veterans using VA health care services. For instance, using the ICD-9 diagnostic codes in the NPCD, Kang and Hyams (2005) found that 10% of 48,733 veterans who received health care at VA facilities between 2003 and 2004 possessed a PTSD diagnosis. Similarly, Seal, Bertenthal, Miner, Sen, and Marmar (2007) observed that 13% of 103,788 Operation Enduring Freedom/Operation Iraqi Freedom (OEF/OIF) veterans first seen at VA facilities between 2001 and 2005 received a diagnosis of PTSD.

An important underlying assumption of these and other studies is that the ICD-9 data in the NPCD accurately represent patients' PTSD diagnostic status. Yet, in all of the aforementioned studies, diagnostic information from various parts of the NPCD was never confirmed using standardized diagnostic interviews with interrater reliability estimates. Studies of the accuracy of other EMR diagnoses, such as diabetes (Harris et al., 2010), depression (Trinh et al., 2011), cardiovascular disease or pulmonary diseases (Liaw et al., 2012), and hypertension (Szeto, Coleman, Gholami, Hoffman, & Goldstein, 2002) suggest that an assumption of complete diagnostic accuracy is incorrect. Potential explanations for diagnostic misclassification in the EMR both within and outside of the VA include insufficient documentation practices (Schiff & Bates, 2010); billing or reimbursement incentives (Farmer, Black, & Bonow, 2013); patient self-report biases that either minimize or exaggerate symptom reports (Castro & Keane, 2011); clinicians' use of unreliable, invalid, and/or incomplete assessment methods (Jackson et al., 2011; Rosen et al., 2004; Shear et al., 2000); or any combination thereof.

In three studies, researchers investigated the extent to which the PTSD diagnostic information in the VA databases reflects actual PTSD diagnostic status, and they arrived at widely divergent results. Magruder et al. (2005) found fewer than half of the PTSD cases identified using the Clinician-Administered PTSD Scale (CAPS; Blake et al., 1990) had any indication of PTSD in VistA. Conversely, only a small proportion of veterans (3.4%) with a PTSD diagnosis in CPRS failed to meet CAPS diagnostic criteria. Frayne and colleagues (2010) found that two occurrences of a PTSD diagnosis or one diagnosis by a mental health professional in either outpatient or inpatient encounter data provided the best positive predictive value for self-reported PTSD. Finally, Gravely and colleagues (2011) found that PTSD Checklist (PCL; Weathers, Litz, Herman, Huska, & Keane, 1993) scores of 50 or higher were associated with PTSD according to encounter data.

Results of these prior studies confirm that similar to other EMR diagnoses, PTSD is susceptible to diagnostic classification errors and that these errors do not reflect equivalent rates of false positives and false negatives. However, each of the prior studies has notable methodological limitations, such as varying operational definitions of PTSD and sampling procedures as well as infrequent use of diagnostic interviews as a standard of comparison. None of the studies has evaluated both Problem List and Encounter PTSD diagnoses concurrently in the same sample. Consequently, we examined the extent to which a PTSD diagnosis in the VA NPCD (Problem List or Encounter) can be confirmed by structured interview assessment; moreover, we sought to identify covariates or predictors of both types of misclassification errors (i.e., false positive, false negatives). Overall, we attempted to provide a better understanding of the factors contributing to misclassification or concordance of PTSD diagnosis, while addressing many of the methodological shortcomings of prior studies. We chose to investigate the question in a large, clinical cohort: the Veterans After-Discharge Longitudinal Registry (Project VALOR). The design and methods of this national registry cohort, which were recruited from random lists of veterans who served in Iraq and Afghanistan between 2001 and 2009, includes standardized assessment of diagnostic status and psychosocial function, in addition to extensive medical record data on all participants (R. C. Rosen et al., 2012). This data set provides a unique opportunity to calculate the sensitivity, specificity, positive predictive value (PPV), and negative predictive value (NPV) for different indicators of PTSD in both the Problem List and Encounter data compared with results of a diagnostic interview for PTSD serving as the standard for comparison. Project VALOR's methodology further improves on prior research by allowing us to calculate the validity of VA Problem List and Encounter data with both lifetime and current PTSD diagnostic status determined by diagnostic interview. This is important because PTSD status may change as a function of treatment or fluctuations in symptomatology over time. We also examined the extent to which background or clinical characteristics of the participants predicted concordance between indicators of PTSD status in the VA Problem List and Encounter data and diagnostic interview data.

Method

Participants and Procedure

Project VALOR participants are all veterans who either separated from active duty after serving in OEF/OIF/Operation New Dawn (OND) or completed at least one Reserve/Guard deployment in support of OEF/OIF/OND. In addition, they must have undergone a mental health evaluation at a VA facility, as indicated by a diagnostic interview or psychotherapy procedure code, between July 2008 and December 2009, and must not have been participating in a clinical trial at the time of enrollment. From this source population, we aimed to enroll at least 1,200 men and women with a recent diagnosis of PTSD in the NPCD and 400 men and women without such a diagnosis. For the purpose of study enrollment, consistent with Gravely et al. (2011), we defined the presence of PTSD as at least two instances of a diagnosis of PTSD (primary or secondary ICD-9 code[1]309.81) by a mental health professional associated with two separate visits in the encounter data from the NPCD within the prior year. Individuals who met this criterion were randomly selected from the NPCD at a rate of 3:1 relative to a comparison group of veterans, similarly randomly selected, who had also used VA mental health services (on at least one occasion) but had no occurrence of a PTSD diagnosis in the Encounter data from 2002 to the time of selection (2009–2011). Female veterans were intentionally oversampled at a rate of 1 female: 1 male to enable gender comparisons.

Project VALOR team members at the VA Environmental Epidemiology Service randomly selected a roster of potential participants according to the sampling criteria described previously. VA Boston study staff telephoned veterans and provided additional study details until targeted enrollment was met. Of those contacted by phone (N = 4,391), 2,712 (61.8%) consented to participate. Consented participants were scheduled for a telephone interview with a doctoral-level clinician and asked to complete a packet of self-administered questionnaires prior to the interview (either online or by mail). Of consented participants, 2,169 (80.0%) completed the questionnaires and 1,649 (60.8%) completed both the questionnaires and the diagnostic interview. These 1,649 male and female veterans constitute the Project VALOR Registry.

Those who agreed to participate provided informed consent verbally over the telephone in accordance with the research protocol approved by all local Institutional Review Boards and the Human Research Protection Office of the U.S. Army Medical Research and Materiel Command. After study staff received verbal consent from the veteran, they scheduled a date and time for the telephone interview and reminded the participant to complete the self-administered questionnaire prior to the interview. Participants were compensated $50 for their participation in the registry.

Measures

Trained doctoral-level diagnosticians assessed both current (past month) and lifetime (either past or current) PTSD over the telephone using the PTSD Module of the Structured Clinical Interview for *DSM–IV* (SCID; First & Gibbon, 2004). Interviewers were blind to diagnostic status in the Problem List and Encounter Database. We held regular meetings of assessment personnel to discuss cases in order to ensure diagnostic reliability and to prevent rater drift. We examined the number of PTSD symptoms as well as overall *Diagnostic and Statistical Manual of Mental Disorders*, fourth edition (*DSM–IV*) PTSD diagnosis. Interrater reliability for the SCID computed on the basis of a randomly selected subsample was 96% for both lifetime (κ = .87) and current diagnosis (κ = .91). In addition, trained research assistants accessed participants' files and collected PTSD diagnostic status information from the Patient Problem List. Data were abstracted from the EMR concurrently with the collection of self-report questionnaire and interview data. We then used these data, as well as the study inclusion criteria (i.e., at least two instances of a diagnosis of PTSD by a mental health professional associated with a scheduled clinical Encounter), to examine the extent to which the PTSD diagnostic information in the Problem List and Encounter Database reflected actual PTSD diagnostic status in veterans.

Presence of probable traumatic brain injury (TBI) was assessed using highly structured interview questions created to reflect current TBI classification standards (American Congress of Rehabilitation Medicine, 1993) and indicators of brain injury severity informed by the current literature (e.g., duration of loss of consciousness and posttraumatic amnesia; A. W. Brown et al., 2005; Wilde, Bigler, Pedroza, & Ryser, 2006). Participants were asked whether they ever experienced a head injury or blast exposure that led to altered consciousness, memory loss, seizures, or brain surgery. Participants who endorsed exposure and at least one of these conditions were asked additional questions about each head injury they experienced.

Participants also completed a battery of online questionnaires. *Stressful life events* were counted using the Life Events Checklist (Blake et al., 1995). Respondents indicated which of 17 stressful events had "happened to" them, were "witnessed" or "learned about." *Combat exposure* was assessed using two scales from the Deployment Risk and Resilience Inventory (DRRI; King, King, Vogt, Knight, & Samper, 2006): The *Combat Experiences* scale, which assesses typical warfare experiences, such as being shot at, firing a weapon, and witnessing injury and death, is measured on a 5-point scale ranging from 1 (*never*) to 5 (*daily or almost daily*). The *Aftermath of Battle* scale assesses exposure to additional stressors that may occur following combat, including handling human remains and witnessing human suffering, with items rated "yes" or "no." We also assessed postdeployment *scial support* using the DRRI *Post-deployment Social Support* scale, which examines the extent to which family, friends, and other members of the community provide emotional support and instrumental assistance. Items are rated on a 5-point scale ranging from 1 (*Strongly disagree*) to 5 (*Strongly agree*). *Anxiety and depression* were assessed using the Patient Health Questionnaire (PHQ; Spitzer, Kroenke, & Williams, 1999), a self-report version of the Primary Care Evaluation of Mental Disorders that assesses the presence and frequency of various symptoms, which can be coded either continuously or categorically. Categorization of major depressive syndrome, panic syndrome, or other anxiety syndrome was made using published PHQ cutoffs. *Sleep difficulty* was assessed using the Sleep Problems Scale (Jenkins, Stanton, Niem-

[1] Although *DSM* criteria are used for the purposes of determining a diagnosis, within VA databases, corresponding ICD diagnoses are used for coding purposes.

cryk, & Rose, 1988), a five-item questionnaire that asks respondents to rate the numbers of days they have experienced a variety of sleep problems in the past month. These responses are grouped into six categories ranging from 1 (*Not at all*) to 6 (*22–31 days*). *Anger* was measured using the Dimensions of Anger Reactions (Hawthorne, Mouthaan, Forbes, & Novaco, 2006), a five-item instrument that assesses anger on a 5-point scale ranging from 0 (*Not at all*) to 4 (*Very much*). *Substance abuse* was measured using the Alcohol Use Disorders Identification Test (Saunders, Aasland, Babor, de la Fuente, & Grant, 1993), a 10-item screening questionnaire, and the Two Item Conjoint Screen (R. L. Brown, Leonard, Saunders, & Papasouliotis, 2001). *Suicide risk* was assessed using the suicide module of the Mini International Neuropsychiatric Interview (Sheehan et al., 1998), yielding a total risk score. *Functional impairment* was assessed using the Inventory of Psychosocial Functioning (IPF; Marx et al., 2009), an 80-item self-report measure designed to assess multiple dimensions of functional impairment in the past 30 days. Items are rated on a 7-point scale ranging from 1 (*never*) to 7 (*always*). The IPF yields an overall mean score and scores for seven scales: Romantic Relationships, Family, Work, Friendships and Socializing, Parenting, Education, and Day-to-Day functioning. Participants also were asked to report whether they sought help for emotional problems either during or postdeployment, within or outside the VA.

Statistical Analyses

We categorized participants on the basis of concordance status by comparing PTSD on the SCID with two criteria in VA databases: (a) PTSD in the patient Problem List and (b) two PTSD encounter diagnoses in the NPCD. This resulted in four groups per criterion: (a) those with PTSD in the database and on the SCID (concordant for PTSD); (b) those with PTSD in the database but not according to the SCID; (c) PTSD on SCID only and; (d) no PTSD in either the database or the SCID (concordant for absence of PTSD). We used chi-square, Kruskal–Wallis, and Mann–Whitney tests to calculate p values for differences in the covariates of interest across the four groups, as well as pairwise differences comparing EMR cases with versus without a SCID-based diagnosis and EMR noncases with versus without a SCID-based diagnosis. In subsequent analyses, we combined individuals concordant for PTSD and those concordant for no PTSD into a single concordant group and examined the prevalence of concordant diagnoses and predictors of discordance relative to this group.

To identify potential predictors of concordance status, we examined univariate associations between each covariate of interest and concordance status in logistic regression models. Covariates with a p value $< .1$ were retained for inclusion in a backward stepwise regression model-building procedure. We used multinomial logistic regression models, with concordant diagnoses as the referent group, to examine multivariable-adjusted associations between covariates of interest and PTSD concordance status. Starting with a full model that included all predictors identified in the univariate analyses described previously, we removed the variable with the largest nonsignificant p value and reran the analysis with the new reduced model. We continued this process until all covariates included in the model were associated with concordance status with a p value $< .1$.

The final multivariable multinomial logistic regression model was adjusted for combat exposure, level of postdeployment social support, IPF total score, number of Cluster C and Cluster D symptoms for lifetime PTSD on SCID, presence of panic or anxiety disorder, and reported treatment seeking for emotional problems. Age and gender were also included in the models. Because a small minority of participants ($n = 176$) had missing data on one or more variables, we included only those individuals with complete data ($n = 1{,}473$) in the final multivariate analysis.

As a sensitivity analysis, we imputed the missing data in 25 data sets with standard techniques using the Markov Chain Monte Carlo methods for multiple imputation (MI) and then averaged the parameter estimates obtained from each model using the MI data sets (Yuan, 2011). Other covariates considered but not adjusted for in our final model included marital status, education, household income, military branch, area of deployment, history of military sexual trauma (MST), history of TBI, self-reported health, history of major depression, alcohol use, anger reactions, and sleep problems.

Post hoc analyses were conducted to identify variables differentially associated with the two types of discordant diagnoses in our final multinomial logistic regression model, and additional analyses examined variation by gender. We also used chi-square tests to compare symptomatology (Question B1 on the current SCID, etc.) by concordance group. Area under the receiver operator curve (AUC) was used to compare definitions of PTSD diagnosis. AUC ranges from 0.5 to 1, where 1 indicates a perfect test and 0.5 represents a test that only performs as well as chance. All analyses were conducted using SAS 9.2.

Results

Using at least two instances of a PTSD diagnosis by a mental health professional associated with two separate encounters in the NPCD administrative data within the prior year as an indicator of the presence of PTSD, 1,213 participants were classified as PTSD cases at study entry, and 436 were classified as noncases. Using the Problem List as an indicator, 1,175 participants were classified as PTSD cases, and 474 were classified as noncases. SCID interviews revealed 1,039 current (past month) PTSD cases and 610 noncases (lifetime 1,251 cases and 371 noncases). On average, study participants were 37.5 years of age (range = 22–69 years), and our sample included 825 women (50.0%). Characteristics of study participants in Project VALOR are shown in Table 1.

The overall concordance rate between PTSD status in the NPCD encounter data (two encounters) and current PTSD status on the SCID was 72.3%, with 19.1% of participants positive for PTSD in the NPCD encounter data only and 8.6% positive for current PTSD on the SCID only (see Table 2). The concordance between PTSD in NPCD encounter data and lifetime PTSD status on the SCID was also slightly higher; 79.4% of participants were concordant for PTSD diagnostic status, 8.5% were positive for PTSD in the NPCD only, and 12.1% were positive for lifetime PTSD on the SCID only.

Results using the Problem List data were similar, although concordance was slightly higher on the basis of this measure. Specifically, concordance between PTSD status in the Problem List and current PTSD status on the SCID was 73.2%, with 17.5% of participants positive for PTSD in the Problem List only and

Table 1
Characteristics of 1,649 Participants in Project VALOR

Covariate	Overall (N = 1,649)	M (SD) or %
Age	1,649	37.5 (9.9)
Female (%)	1,649	50.0
Race/ethnicity	1,649	
Black (%)		15.1
Hispanic (%)		12.8
White (%)		66.5
Other/unknown (%)		5.6
Military branch	1,649	
Army (%)		90.4
Marines (%)		9.6
Married or living with partner (%)	1,649	58.3
Fair or poor self-reported health (%)	1,649	37.5
History of military sexual trauma (%)	1,601	12.1
History of mild traumatic brain injury (%)	1,627	37.8
Major depressive syndrome (%)	1,649	41.8
Panic syndrome (%)	1,649	39.2
Other anxiety syndrome (%)	1,649	33.5
Treatment seeking for emotional problems (%)	1,648	87.4
Moderate/high suicide risk (%)[a]	1,647	11.5
AUDIT alcohol use total score	1,641	6.2 (6.6)
Dimensions of Anger Reactions-5 score	1,647	9.8 (5.5)
Jenkins sleep questionnaire mean score	1,616	3.3 (1.4)
DRRI combat exposure total score	1,644	32.6 (12.7)
DRRI postwar social support total score	1,634	49.3 (11.4)
IPF grand mean score	1,639	3.5 (0.9)
SCID lifetime PTSD total symptom score	1,616	11.8 (4.7)

Note. AUDIT = Alcohol Use Disorders Identification Test; DRRI = Deployment Risk and Resilience Inventory; IPF = Inventory of Psychosocial Functioning; SCID = Structured Clinical Interview for *DSM–IV*; PTSD = posttraumatic stress disorder.
[a] Mini-International Neuropsychiatric Interview suicide risk score ≥ 9.

9.3% positive for current PTSD on the SCID only (see Table 2). The concordance between PTSD in Problem List and lifetime PTSD status on the SCID was slightly higher; 78.5% of participants were concordant for PTSD diagnostic status, 7.7% were positive for PTSD in the Problem List only, and 13.7% were positive for lifetime PTSD on the SCID only.

Sensitivity, specificity, positive predictive value, and negative predictive values for both current and lifetime PTSD diagnosis are presented in Table 3. Using current PTSD diagnosis according to the SCID as the standard for comparison, PTSD in the Problem List had a slightly higher AUC of 0.69 for diagnosis of PTSD compared with an AUC of 0.67 for PTSD using two encounter diagnoses in the NPCD. Consequently, Problem List diagnosis was used to establish concordance or discordance in subsequent analyses.

There were 886 participants with PTSD both in the Problem List and on the SCID-based diagnostic interview for current PTSD (true positives), 289 had PTSD according to the Problem List only (false positives), 153 had PTSD on the SCID only (false negatives), and 321 were found not to have PTSD based on both the Problem List and the SCID (true negatives).

Characteristics of the participants by PTSD concordance status are displayed in Table 4. The prevalence of fair/poor self-reported health, major depressive/anxiety syndromes, history of MST and TBI, and treatment seeking for emotional problems all differed significantly between the four concordance groups, as did mean age and the mean scores for all assessments. True positives were older on average (M = 38.0 years) than false positives (M = 36.9 years), and false negatives were older on average (M = 38.6 years) compared with true negatives (M = 36.0 years). There were fewer females (47.5%) in the true positive group compared with 54.7% in the PTSD in the false-positive group. Compared with false positives, true positives were more likely to have assessment scores indicating problems with alcohol use, anger reactions, sleep problems, and psychosocial functioning, in addition to the lowest levels of postwar social support.

In our final multinomial logistic regression model (see Table 5), several covariates were significantly associated with discordance between PTSD diagnoses from the Problem List and SCID interview for current PTSD. Compared with true positives and true negatives, false negatives had significantly lower

Table 2
Concordance Between PTSD Status From Electronic Medical Record (EMR) Problem List and SCID-Based Diagnostic Interview in 1,649 Project VALOR Study Participants

PTSD assessment	PTSD in NPCD Encounter data[a]	PTSD in EMR Problem List[b]	Current PTSD on SCID	Lifetime PTSD on SCID
PTSD in NPCD Encounters[a]	100%			
	88.4%	100%		
	Problem List only: 4.7%			
PTSD in EMR Problem List[b]	Encounter only: 7.0%			
	72.3%	73.2%	100%	
	SCID only: 8.6%	SCID only: 9.3%		
Current PTSD on SCID	EMR only: 19.1%	EMR only: 17.5%		
	79.4%	78.5%	85.6%	100%
			Lifetime but not current	
	SCID only: 12.1%	SCID only: 13.7%	PTSD: 14.4%	
Lifetime PTSD on SCID[c]	EMR only: 8.5%	EMR only: 7.7%		

Note. PTSD = posttraumatic stress disorder; SCID = Structured Clinical Interview for *DSM–IV*; NPCD = National Patient Care Database.
[a] At least two instances of a diagnosis of PTSD (International Classification of Disease–9–CM code 309.81) associated with a clinical Encounter with a mental health professional within the past year. [b] On the basis of 1,649 participants with data on PTSD problem list information. [c] Twenty-seven patients from an initial pilot study are missing Lifetime PTSD on SCID.

Table 3
Sensitivity, Specificity, Positive Predictive Value (PPV), and Negative Predictive Value (NPV) for Current and Lifetime PTSD Diagnosis[a]

Variable	Sensitivity	Specificity	PPV	NPV
EMR Problem List vs. SCID (current)	85.3%	52.6%	75.4%	67.7%
Encounter diagnosis vs. SCID (current)	86.4%	48.4%	74.0%	67.7%
Problem List vs. SCID (lifetime)	82.2%	66.3%	89.2%	52.5%
Encounter diagnosis vs. SCID (lifetime)	84.3%	62.8%	88.4%	54.3%

Note. PTSD = posttraumatic stress disorder; EMR = electronic medical record; SCID = Structured Clinical Interview for *DSM–IV*.
[a] Base rates for current PTSD = 0.63; lifetime PTSD = 0.77.

levels of combat exposure (OR = 0.64; 95% CI [0.53, 0.78] per 10-unit increase in DRRI combat exposure total score) and were less likely to report symptoms consistent with panic disorder as assessed by the PHQ (OR = 0.63; 95% CI [0.42, 0.93]). False negatives had significantly lower IPF scores (OR = 0.79; 95% CI [0.64, 0.97] per one-unit increase in grand mean score), fewer Cluster C symptoms (OR = 0.69; 95% CI [0.62, 0.77]), and a higher number of Cluster D symptoms (OR = 1.34; 95% CI [1.14, 1.58]) for lifetime PTSD, compared with true positives and negatives. False positives were also less likely to report an anxiety disorder other than panic disorder (OR = 0.64; 95% CI [0.44, 0.92]), and were more likely to report treatment seeking for emotional problems (OR = 2.65; 95% CI [1.54, 4.55]), compared with true positives and negatives. The associations observed with several covariates differed significantly for the two types of discordant diagnoses compared with

Table 4
Characteristics of 1,649 Participants in Project VALOR by Concordance Between PTSD Status in Electronic Medical Record (EMR) Problem List and SCID-Based Diagnostic Interview for Current PTSD

Covariate	Concordant for PTSD (n = 886)	PTSD in EMR only (n = 289)	p[a]	PTSD on SCID only (n = 153)	Concordant for no PTSD (n = 321)	p[b]
Age (M and [SD])	38.0 (9.6)	36.9 (10.3)	.015	38.6 (10.1)	36.0 (9.9)	.002
Female (%)	47.5	54.7	.03	52.3	51.7	.91
Race/ethnicity			.10			.046
Black (%)	10.8	9.7		17.0	10.9	
Hispanic (%)	9.4	10.4		11.1	8.7	
White (%)	53.8	60.6		48.4	61.7	
Other/unknown (%)	26.0	19.4		23.5	18.7	
Military branch			.50			.73
Army (%)	90.7	92.0		89.5	88.5	
Marines (%)	9.3	8.0		10.5	11.5	
Married or living with partner (%)	58.1	60.2	.53	59.5	56.4	.52
Fair or poor self-reported health (%)	48.2	30.1	<.001	34.0	16.5	<.001
History of military sexual trauma (%)	15.5	11.5	.10	13.3	2.9	<.001
History of mild traumatic brain injury (%)	47.8	29.9	<.001	30.3	20.8	.02
Major depressive syndrome (%)	56.8	26.6	<.001	45.1	12.5	<.001
Panic syndrome (%)	52.9	29.4	<.001	34.0	12.8	<.001
Other anxiety syndrome (%)	46.2	20.4	<.001	32.7	10.6	<.001
Treatment seeking for emotional problems (%)	94.8	91.4	.03	90.2	62.0	<.001
Moderate/high suicide risk (%)[c]	15.6	9.4	.009	8.5	3.4	.02
AUDIT alcohol use total scored (M and [SD])	7.0 (7.1)	5.2 (5.8)	<.001	6.4 (6.4)	5.0 (5.2)	.046
Dimensions of Anger Reactions-5 score (M and [SD])	11.6 (5.2)	8.3 (5.0)	<.001	10.0 (4.9)	6.2 (4.9)	<.001
Jenkins sleep questionnaire mean score (M and [SD])	3.8 (1.2)	3.0 (1.4)	<.001	3.4 (1.3)	2.3 (1.5)	<.001
DRRI combat exposure total scored (M and [SD])	36.2 (13.2)	31.2 (11.8)	<.001	29.1 (9.1)	25.2 (8.8)	<.001
DRRI postwar social support total scored (M and [SD])	46.5 (10.7)	52.6 (10.4)	<.001	48.0 (10.1)	54.6 (12.1)	<.001
IPF grand mean scored (M and [SD])	3.8 (0.9)	3.2 (0.9)	<.001	3.6 (0.8)	2.9 (0.8)	<.001
SCID lifetime PTSD total symptom score (M and [SD])	14.3 (1.6)	11.7 (3.0)	<.001	13.2 (1.8)	8.1 (4.2)	<.001

Note. PTSD = posttraumatic stress disorder; SCID = Structured Clinical Interview for *DSM–IV*; AUDIT = Alcohol Use Disorder Identification Test; DRRI = Deployment Risk and Resiliency Inventory; IPF = Inventory of Psychosocial Functioning.
[a] p values comparing individuals concordant for PTSD and those with PTSD in EMR only, calculated using Mann–Whitney tests (continuous variables) or chi-square tests (categorical variables). [b] p values comparing individuals concordant for no PTSD and those with PTSD on SCID only, calculated using methods noted above. [c] Mini-International Neuropsychiatric Interview suicide risk score ≥ 9.

Table 5
Odds Ratios and [95% Confidence Intervals] for Statistically Significant Predictors of Discordance in PTSD Status From Electronic Medical Record (EMR) Problem List and SCID Interview for Current PTSD in 1,649 Project VALOR Study Participants With Complete Data for All Covariates

Covariate[a]	Concordant for PTSD status[b]	PTSD in EMR only	PTSD on SCID only	*p* value for heterogeneity[c]
Combat exposure[d]	1.00 (ref)	0.99 [0.86, 1.14]	**0.64 [0.53, 0.78]**	<.001
DRRI support[d]	1.00 (ref)	1.02 [1.00, 1.03]	1.00 [0.98, 1.02]	.089
Inventory of Psychosocial Functioning[e]	1.00 (ref)	**0.79 [0.64, 0.97]**	1.05 [0.82, 1.34]	.058
Number of Cluster C symptoms for lifetime PTSD[f]	1.00 (ref)	**0.69 [0.62, 0.77]**	1.03 [0.89, 1.19]	<.001
Number of Cluster D symptoms for lifetime PTSD[f]	1.00 (ref)	**1.34 [1.14, 1.58]**	1.24 [0.99, 1.56]	.572
Panic syndrome	1.00 (ref)	0.83 [0.59, 1.15]	**0.63 [0.42, 0.93]**	.257
Presence of other anxiety syndrome[g]	1.00 (ref)	**0.64 [0.44, 0.92]**	0.89 [0.59, 1.34]	.192
Treatment seeking for emotional problems	1.00 (ref)	**2.65 [1.54, 4.55]**	1.18 [0.63, 2.21]	.041

Note. PTSD = posttraumatic stress disorder; SCID = Structured Clinical Interview for *DSM–IV*; DRRI = Deployment Risk and Resilience Inventory. Boldface values indicate statistically significant results.
[a] Model adjusted for all covariates listed plus categorical age (<30, 30–39, 40–49, or ≥50 years) and gender. [b] Concordant for PTSD or no PTSD based on EMR Problem List and current SCID. [c] *p* value from chi-square test for difference in associations for each covariate with each type of discordant diagnosis. [d] DRRI combat exposure total score; odds ratio per 10-unit increase in score. [e] Odds ratio per one-unit increase in grand mean score. [f] Cluster C: persistent avoidance of stimuli associated with the trauma and numbing of general responsiveness not present before the trauma; Cluster D: persistent symptoms of increased arousal not present before the trauma. [g] Anxiety syndrome other than panic syndrome.

those concordant for PTSD. *P* values from chi-square tests for differences in the associations of each covariate with each type of discordance were statistically significant for combat exposure, number of Cluster C symptoms for lifetime PTSD, and treatment seeking for emotional problems, indicating that the direction of the associations between these covariates and each type of discordant diagnosis differs (e.g., covariates are more strongly associated with one type of discordant diagnosis). Results were unaltered when we performed a sensitivity analysis using MI of missing data. In general, the concordance results stratified by gender were similar to those for men and women combined, and there were no statistically significant interactions with gender (results not presented).

The specific criterion PTSD Cluster B, C, and D symptoms varied across the four concordance groups, with chi-square tests indicating significant differences associated with each symptom ($p < .001$ for each). Across PTSD symptom clusters, the highest number of symptoms in each case was in the true positive group. The next highest symptom rate reported was in the false-positive group, followed by the false-negative group, with the lowest frequency of symptoms in the true negative group (see Figure 1).

Discussion

Our analyses revealed that more than one quarter of current PTSD diagnoses and more than one fifth of lifetime PTSD diagnoses in the Problem List were discrepant from those obtained by structured diagnostic interview. These results raise concerns about the validity of a significant number of PTSD diagnoses contained in VA EMRs. Importantly, we noted varying proportions of misclassification, including both false-positive and false-negative diagnostic errors, which may have important implications for policy, research, and clinical care. For current PTSD, we observed approximately twice as many false positives as false negatives. The inverse was true for lifetime diagnoses. A higher proportion of current false positives and lower proportion of lifetime false negatives may be the result of participants who met criteria for PTSD in the past having recovered by the time of the interview. Higher lifetime false negatives may reflect diagnoses for which assessment or treatment was never sought and thus was only observed by retrospective inquiry. Receiver operating characteristic AUC analyses suggested that relative to PTSD diagnoses from the NPCD, PTSD diagnoses gleaned from patients' problem lists may be marginally more accurate. This may be the result of increased attention by clinicians, rather than the simple recording of a provisional or routine diagnosis required for billing purposes. Our findings differed from those obtained by Magruder and colleagues (2005), with our results showing higher sensitivity, but substantially lower specificity. The PPV for our results based on EMR Problem List lifetime diagnoses (89%) was slightly higher than that observed by Frayne and colleagues (2010; 82%); however, we observed a lower NPV for Problem List based diagnoses (53% vs. 88%). For current PTSD, we observed a PPV somewhat lower than Gravely and colleagues (2011; 75% vs. 82%), though they did not report NPV. Possible explanations for these differences may include differences in samples (age, era, geographical distribution, etc.) as well as differences in diagnostic criteria or assessment methodology.

Differences in the prevalence of current and lifetime PTSD in our population versus others will also influence observed differences in the PPV and NPV. In our study, 63% had current PTSD, and 77% had lifetime PTSD based on SCID diagnoses, which is substantially higher than the overall 11.5% reported by Magruder and colleagues (2005). Although the other studies cited did not report PTSD prevalence, we would expect them to be in the same range based on population estimates. Analysis of covariates or predictors of misclassification demonstrated that higher levels of combat exposure and panic symptoms were associated with decreased risk of false negatives, which may reflect the influence of these factors on clinical reporting. Reported treatment seeking for emotional difficulties was associated with an increased risk of false positives for current PTSD. One explanation for this is the possibility that some individuals could be communicating more

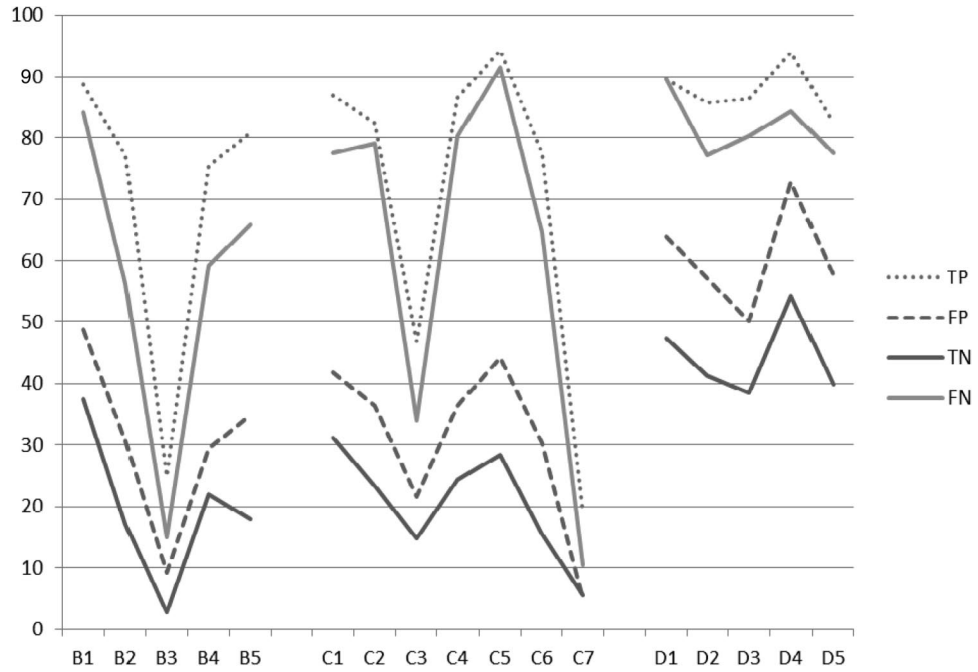

Figure 1. Percentage with posttraumatic stress disorder (PTSD) symptoms by concordance status. TP = true positive; FP = false positive; TN = true negative; FN = false negative. B, C, and D = PTSD Cluster B, C, and D symptoms.

distress, although not necessarily a greater number of symptoms. This may be due to elevated symptom reports in a clinical setting versus a research interview, or may reflect undocumented improvements due to treatment, a potential weakness of problem list diagnoses. Finally, symptom profiles also affected the risk of false positives, with more avoidance symptoms decreasing the risk and more hyperarousal symptoms increasing the risk. This may be due to a perception that some symptoms are more emblematic of PTSD. Although less than 30% of the sample endorsed dissociative experiences and that less than 50% endorsed psychogenic amnesia, this finding is consistent with other reports of symptom prevalence. For instance, Holowka, Marx, Kaloupek, and Keane (2012) found these to be among the least frequently endorsed symptoms among Vietnam combat veterans with PTSD.

Another notable finding was that veterans presenting with either the most or the fewest symptoms had the highest proportion of concordant diagnoses in the SCID and Problem List. This is not surprising again, given that differential diagnosis is likely to be less challenging under such conditions, resulting in a higher probability of agreement.

In accounting for misclassification errors, various explanations are possible. Medical decision-making research supports several alternative hypotheses in this regard (Norman & Eva, 2010). For instance, a diagnosis that was appropriate in the past may no longer apply, due to successful treatment or remission over time. However, this explanation is unlikely to account for more than a small proportion of discordant diagnoses in our population. On the basis of the SCID assessment, 14.4% of participants qualified for a lifetime diagnosis of PTSD but did not meet current PTSD criteria. Insufficient knowledge, patient or institutional pressures, atypical symptom presentation, and cognitive biases or other information-processing errors might have influenced misclassification errors (Norman & Eva, 2010). Of course, it is also possible that in some instances, discordance may be related to discrepancies or errors in the SCID interview rather than in the electronic record. It is conceivable that some clinicians conducted even more in-depth assessments than the SCID and had access to other sources of information (e.g., collateral reports), which could arrive at divergent, but more valid, results.

A further explanation includes the possibility that such discordance indicates more difficult diagnostic distinctions that may be less rigorously assessed in routine clinical assessments than in research protocols. The use of chart diagnosis to define PTSD status (or other psychopathology) can be contrasted with more rigorous approaches in psychological and psychiatric research. Most of the research literature on the diagnosis of PTSD relies on standardized, validated instruments, such as screens, questionnaires, or structured interviews. In clinical settings, however, routine diagnosis of mental health problems does not frequently make use of such standardized measures, even during formal assessments (Jackson et al., 2011). Rather, clinicians typically use more informal assessment methods for formulating a diagnosis, which may persist after being entered into the medical record.

It is the case that in some instances, the presence or absence of one symptom can affect a patient's overall diagnosis. In general, the group with SCID-only PTSD diagnoses (false negatives) had symptom profiles that most closely resembled the group that was concordant for both SCID and medical record diagnosis, consistent with the idea of diagnostic complexity accounting for discordance. Surprisingly, less functional impairment was associated with higher risk for false positives, although this may also indicate improvement from a previous condition. A final possibility is that

participants are more likely to exaggerate symptoms in a clinical setting, compared with a confidential phone interview.

These results also have important implications for further research. To the extent that some studies of the prevalence, etiology, and course of PTSD among VA treatment-seeking samples rely on NPCD or EMR diagnoses, this may be cause for concern. Similarly, examinations of genetic, biological, social, and psychological factors associated with PTSD may be compromised or may yield weakened or obscured relationships. For instance, the Million Veteran Program (U.S. Department of Veterans Affairs, 2013) is a national effort by the VA that examines genetic factors associated with various health conditions, including PTSD. The fact that a significant proportion of diagnoses may be due to misclassification errors, with more than twice as many false positives as false negatives in the Problem List or Encounter data, could significantly hamper efforts of researchers to detect putative associations. Given the centrality of proper identification of cases (i.e., phenotypes), important research into risk and resiliency factors and healthcare utilization may be similarly affected by inaccurate measurement. Given our results here, similar questions remain about the validity of other behavioral health and mental health diagnoses.

Finally, diagnostic inaccuracies in the EMR may have implications for clinical care. Within any health care system, accurate diagnosis is crucial for reimbursement and billing and providing the best clinical care to those who need it. However, diagnostic errors in medicine contribute to inefficient or inappropriate treatment, poor use of limited resources, and can also result in patient harm (Newman-Toker & Pronovost, 2009). Given the rising economic and personal costs associated with mental illness, more work in this area is urgently needed.

Although these results are from a sample of veterans using VA services, VA hospitals are not unlike other larger healthcare organizations across the country. In fact, the VA health care system is the largest health services delivery network in the country, and recent studies suggest that the care provided within the VA is equivalent or better quality care than in other health care systems, with fewer errors (Asch et al., 2004; Trivedi et al., 2011). This suggests the possibility of even higher rates of more misclassification in other healthcare settings. Furthermore, with many veterans seeking health care outside the VA, clinicians in varied settings serving this population ought to pay careful attention to diagnostic issues. Although the VA was an early adopter of computerized medical records, EMRs are increasingly becoming the norm. Indeed, as the country moves toward standardized systems, this issue will become even more important. The Department of Health and Human Services mandates the use of problem lists in order to receive federal certification of EMRs, and their use is also required for Joint Commission accreditation (Wright, Maloney, & Feblowitz, 2011). Thus, with increased availability of Problem List and administrative data, the odds of these data being used to inform policy decisions similarly increases, highlighting the importance of continued attention to integrity and accuracy of these data.

Among the limitations of this study are a disproportionally low rate of participation by Marines, lack of supporting information about how medical record diagnoses were made, lack of objective measures of treatment engagement, and restriction of our sample to combat exposed veterans who had undergone a mental health assessment. Furthermore, our sample consists of veterans who have obtained at least some services through the VA. Although the majority (57%) of OEF/OIF/OND veterans have obtained some VA health care, a substantial minority have not (U.S. Department of Veterans Affairs, 2013). Veterans who use the VA may be less likely to have private health insurance or other financial resources and may be more symptomatic than the veteran population, in general. Finally, participants were selected on the basis of two visits with a health care professional in order to increase the odds of enrolling participants with true PTSD into the registry; however, this may have biased the sample by excluding veterans who only used VA mental health services on one occasion. Strengths of this study include the use of a national sample with equal numbers of male and female veterans and the use of standard clinical diagnostic instruments in the assessment of PTSD.

In summary, diagnostic misclassification occurred in more than one quarter of the cases analyzed in the current study, suggesting that greater attention needs to be paid to increasing diagnostic accuracy for clinical or research purposes when using EMRs. Specifically, more rigorous assessment (and documentation thereof) ought to be encouraged. Health care systems should mandate minimum standards, including psychometrically sound interviews and/or inclusion of validated, self-report measures to improve diagnostic accuracy (e.g., CAPS; PCL). Furthermore, mandating regular review of problem lists and updating of active and inactive problems is likely to reduce the rate of misclassification errors. Although EMR keeping remains a powerful tool for clinical care and research, it behooves the psychological community and the healthcare community more broadly to devote sufficient attention to how these data are collected, maintained, and used.

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Understanding Unemployment Longitudinally Among Returning Veterans

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Background

- Unemployment rates for Operation Enduring Freedom (OEF) and Operation Iraqi Freedom (OIF) veterans (7.2%) are higher than for either civilians (6.0%) or for veterans who served in other conflicts (5.3%).
- Unemployment is associated with a range of negative outcomes, including hypertension, alcohol abuse/dependence, illicit substance abuse/dependence, property/violent offending, and major depression (Fergusson, McLeod, & Horwood, 2014; Jefferis et al., 2011; Nygren, Gong, & Hammarstrom, 2015)
- Few studies have examined the factors associated with unemployment in OEF/OIF veterans. One exception is Cohen, Suri, Amick & Yan (2013), who found that unemployed OEF/OIF veterans were significantly more likely to be depressed than those who were employed.
- The goal of the current study was to identify demographic and clinical factors that may be associated with stable unemployment among OEF/OIF veterans.

Participants

- Participants were drawn from the Veterans After-Discharge Longitudinal Registry (Project VALOR):
  - 1,649 U.S. Army & Marine Corps OEF/OIF/OND combat veterans in the VA Healthcare System
  - Nationwide Sample
  - 50% Female
  - 75% with 2 PTSD encounter diagnoses within 1 year
  - 25% without a PTSD diagnosis
- In the current study, we only included participants for whom we had Time 1 (T1) and Time 2 (T2) employment data.
- Participants who were not included did not differ from those who were on any demographic or clinical variables.
- Current Sample (n = 1305):
  - Age: M = 33.6 years (SD = 6.3 years)
  - Gender: 50.8% female
  - Race:
    - 78.8% Caucasian
    - 16.5% African American
    - 3.1% Native American/Alaska Native
    - 2.1% Asian
    - 0.8% Native Hawaiian/Other Pacific Islander
  - Education: 89.3% at least some college

Measures

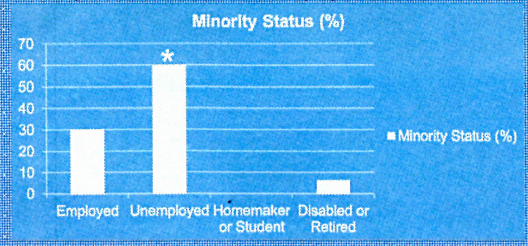
- Outcome Measures (Assessed at T1):
  - Demographics
  - PTSD Checklist (PCL-IV; Weathers et al., 1993)
  - Inventory of Psychosocial Functioning (IPF; Marx et al., 2009)
  - Patient Health Questionnaire (PHQ-9; Spitzer, Kroenke, & Williams, 1999)
- Employment status was assessed at T1 and T2 using one item:
  - Which of the following best describes your current work situation?
  - Participants chose one of nine possibilities:
    1. Working for pay full time
    2. Working for pay part time
    3. Unemployed and looking for work
    4. Temporarily laid off, on sick leave, or on another leave
    5. Full time homemaker
    6. Full time student
    7. Disabled
    8. Retired

Results

- We collapsed the employment variables into three categories according to the department of labor: employed, unemployed, and out of the workforce.

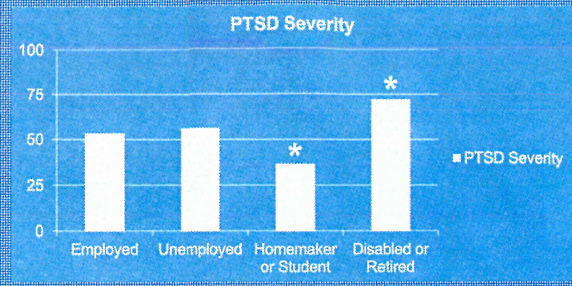
Employment Status at Time 1	Employment Status at Time 2	n
Employed	Employed	567
Employed	Unemployed	17
Employed	Out of the workforce	41
Unemployed	Employed	73
Unemployed	Unemployed	15
Unemployed	Out of the workforce	23
Out of the workforce	Employed	161
Out of the workforce	Unemployed	10
Out of the workforce	Out of the workforce	208

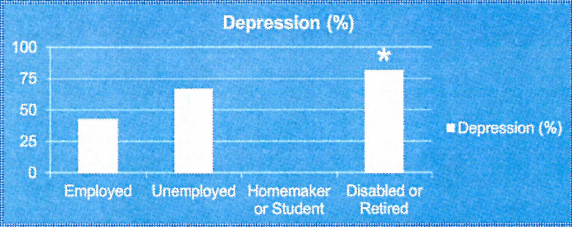
- Veterans who were unemployed demonstrated the most variability. We explored what factors predicted group membership at T2 for veterans unemployed at T1.

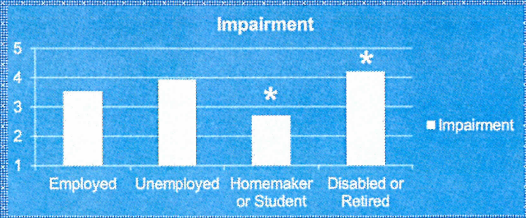


Project VALOR: Trajectories of Change in PTSD in Combat-Exposed Veterans: W81XWH-12-2-0117

Results







Conclusions

- Participants who remained unemployed were more likely to endorse minority racial status. No other demographic characteristics were significant.
- Higher levels of PTSD severity and functional impairment, as well as probable depression at T1 predicted that veterans who were unemployed at T1 would identify as disabled/retired by T2.
- Interestingly, veterans who were unemployed at T1 and were homemakers/students by T2 had significantly lower PTSD severity and less impairment at T1.
- Future research is needed to examine bidirectional relationships and potential mediators.

Sex Differences Between Self-report and Clinician-assessed Military Sexual Trauma (MST) in Operation Enduring Freedom (OEF) & Operation Iraqi Freedom (OIF) Veterans

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INTRODUCTION

- Military sexual trauma (MST), defined as sexual harassment or assault that occurred during military service (VA, 2004) is associated with negative mental and physical health outcomes among veterans (Suris & Lind, 2008)
- Previous research among Operation Enduring Freedom(OEF)/Operation Iraqi Freedom (OIF) veterans seeking health services found that 15.1% of females and 0.7% of males report MST (Kimerling et al., 2010). However, these rates vary across studies (Suris & Lind, 2008)
- Prevalence rate variability may result from unstandardized MST definitions, different assessment methods, and sample demographics (Suris & Lind, 2008)
- Stigma related barriers may also contribute to reporting variability, e.g. with victims fearing they will not be believed, belief in rape myths (e.g., victims secretly enjoy being assaulted), self-blame etc. (Turchik et al., 2013)
- The salience of gender role stereotypes/stigma among military personnel (Hosoda & Stone, 2000), may contribute to disparities in MST endorsement, particularly underreporting among male veterans (Turchik et al.,2013)
- Assessment modalities that ensure greater anonymity (e.g. self-report measures) elicit greater willingness to endorse stigmatized experiences/behaviors (Schwartz et al., 1991; Sobell & Sobell, 1981)
- Therefore, it is important to understand the impact of assessment method (e.g. self-report v. clinician interview) on reporting as well as any related sex differences

STUDY AIM & HYPOTHESES

- This study examined whether the manner in which MST is assessed (self-report v. clinician interview) influences rates of MST endorsement among male and female OEF/OIF veterans

1. Across both genders, MST will be endorsed at higher rates via self-report compared with interview
2. Furthermore, we anticipated that male veterans would have a greater disparity across assessment methods compared with female veterans

METHODS

Participants

- 1,308 OEF/OIF veterans enrolled in Project VALOR (Veterans' After-Discharge Longitudinal Registry)
  - Mean age = 33.6 years (SD = 6.2, Range: 22-47 years old)
  - 51% female
  - 75.4% White, 16.1% Black, 1.8% Asian, 2.9% American Indian, .7% Pacific Islander, 3% Other

Procedure

- Data were collected as a part of a larger study
- Participants completed a MST interview and a self-report questionnaire at a single time point

Measures

	Items	Measured Construct
Deployment Risk and Resilience Inventory-2 (DRRI-2)	8 items*	Sexual Harassment – 3 items Sexual Assault – 5 items
Clinician-administered MST interview	2 items*	Sexual Harassment – 1 item Sexual Assault – 1 item

*MST was coded dichotomously for overall presence/absence of any MST experience as well as within each subtype (sexual harassment or assault)

RESULTS

- On average across the two reporting methods, female veterans had a higher prevalence of MST (74.2%) compared with male veterans (16.3%), z = 20.98, p = <0.001
- MST was endorsed at higher rates via self-report compared with the interview for both male (26.4% v. 6.2%; z =9.75, p<.001) and female veterans (76.8% v. 71.5%; z = 2.188, p<.05)
- Compared with female veterans (5.3%), male veterans (20.2%) displayed a significantly larger disparity between interview and self-report assessment methods (z = -8.12, p <0.001)

Table 1. Percent of participants who endorsed experiencing sexual harassment

	Clinician-administered MST interview	Deployment risk and Resilience Inventory – 2 (DRRI – 2)
Female	67.5%	75%
Male	5.8%	25.4%

Table 2. Percent of participants who endorsed experiencing sexual assault

	Clinician-administered MST interview	Deployment risk and Resilience Inventory – 2 (DRRI – 2)
Female	34.5%	50.7%
Male	1.1%	4.8%

RESULTS CONT.

- When examining the disparity in reporting across the individual types of MST:
  - There was **greater** disparity in males than females for reporting sexual harassment (19.6% v. 7.5%; z = -6.44, p<0.001)
  - Females had greater rates of disparity in endorsing sexual assault endorsement than males (16.2% v. 3.7%; z = 7.47, p<.001)

DISCUSSION

- Consistent with the literature, we found that female veterans endorsed higher rates of MST than male veterans
- Furthermore, method of inquiry influences endorsement rates, with all veterans being more likely to endorse MST on a self-report measure than on a clinician-administered interview
- Of particular importance, findings suggest that overall, male veterans are susceptible to decreased reporting in an interview format.

Study limitations

- Results may have been influenced by variability in the number and content of question items across self report and interview methods.
- Self-report and interview data were not collected in a standardized environment which may have influenced findings.

Future Directions/Implications

- These findings may facilitate the development of a more efficient and standardized method of screening for MST, particularly for male veterans.
- Future studies could examine stigma in specific subpopulations (e.g. LGBT, racial/cultural) whose endorsement might be particularly influenced by assessment method
- Future studies should consider examining whether the sex of the interviewer influences disclosure rates during screen for MST

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Project VALOR: Trajectories of Change in PTSD in Combat-Exposed Veterans: W81XWH-12-2-0117

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Reports of Military Sexual Trauma Among Returning Veterans: Who Are We Missing?

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Background

- Military Sexual Trauma (MST) is associated with a range of outcomes, including DD, PTSD, and GAD, past history of a suicide attempt and current suicidal ideation, and decreased quality of life (Klingensmith, Tsai, Mota, Southwick, & Pietrzak, 2014).
- The Veterans' Health Administration (VHA) MST screening program was developed to ensure that veterans who experienced MST receive appropriate services.
- However, sexual trauma is historically underreported (Fisher, Daigle, Cullen & Turner, 2003). Therefore, it is possible that the VHA MST screening program is not identifying all MST survivors.
- In this study, we examined how concordant veterans' reports of MST on the VHA screen were with their reports during a structured interview.
- Further, we explored how veterans who were discordant in their MST reports differed from those who endorsed experiencing MST on both the screen and the interview.

Participants

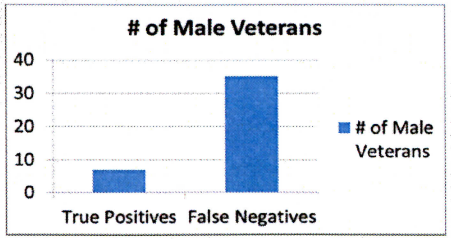
- Participants were drawn from the Veterans After-Discharge Longitudinal Registry (Project VALOR):
  - 1,649 U.S. Army & Marine Corps OEF/OIF/OND combat veterans in the VA Healthcare System
  - 50% Female
  - 75% with 2 PTSD encounter diagnoses within 1 year
  - 25% without a PTSD diagnosis
- In this study, we only included participants for whom we had both VHA MST screen data and MST interview data
- Current Sample (n = 1306):
  - Age: M = 40.7 years (9.8 years)
  - Gender: 50.7% female
  - Race:
    - 78.8% Caucasian
    - 16.8% African American
    - 3.4% Native American/Alaska Native
    - 2.2% Asian
    - 0.7% Native Hawaiian/Other Pacific Islander
  - Education: 89.6% at least some college

Measures

- MST:
  - Both the VHA MST screen and the MST interview consist of two questions. An affirmative response to either item is indicative of MST.
    1. Did you receive uninvited and unwanted sexual attention, such as touching, cornering, pressure for sexual favors, or verbal remarks?
    2. Did someone ever use force or threat of force to have sexual contact with you against your will?
  - Based on screen and interview responses, participants were grouped into one of four categories:
    1. **True Positives (TP)**: MST+ on screen and interview (n = 237)
    2. **True Negatives (TN)**: MST- on screen and interview (n = 770)
    3. **False Positives (FP)**: MST+ on screen and MST- on interview (n = 14)
    4. **False Negatives (FN)**: MST- on screen and MST+ on interview (n = 285)
  - Demographic questionnaire
  - PTSD Checklist for DSM-5 (PCL-5; Weathers et al., 2013)
  - Alcohol Use Disorders Identification Test (AUDIT; Bradley et al., 2003)
  - Inventory of Psychosocial Functioning (IPF; Marx et al., 2009)
  - Treatment engagement and barriers questionnaire

Results

- Concordance:
  - 77.1% of the sample was concordant
  - Only a small percentage of discordant veterans (1.1%) were MST+ on the screen and MST- on the interview (FP)
  - However, a large minority of veterans (21.8%) were MST- on the screen and MST+ on the interview (FN)
  - The FNs are the veterans we are missing with the screen. How do they differ from the TPs?



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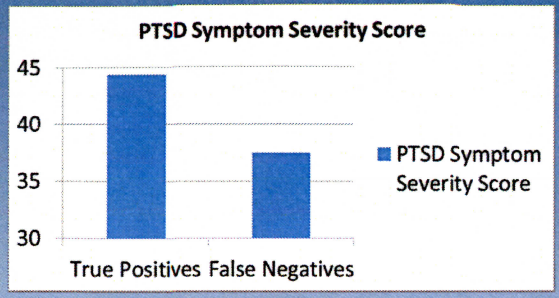
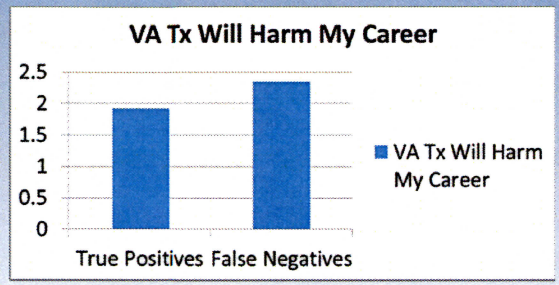
Results (continued)





Conclusions

- FNs were significantly more likely to be men ($\chi^2 = 15.21$; $p < .001$) than TPs
- In general, FNs and TPs were not distinguishable based on psychopathology
  - FNs did have significantly lower PTSD severity scores ($t = 3.81$; $p < .001$) than TPs, but both were in the PTSD dx range
  - In addition, FNs and TPs did not differ on alcohol abuse ($t = .28$; $p > .05$) or functional impairment ($t = .76$; $p > .05$)
- FNs and TPs did not differ on the rates at which they sought mental health care at VA facilities ($\chi^2 = .11$; $p > .05$). However, FNs were more likely to report that they did not seek care at VA facilities for fear that it would harm their careers ($t = 2.87$; $p < .01$)
- These results provide preliminary evidence that although TPs and FNs do not tend to differ by psychopathology, they do differ across gender lines. Further, findings suggest that FNs may resist seeking treatment due to fear of repercussions.
- Future studies should focus on alternative methods for capturing the FNs, so they can get the treatment they need.

A Longitudinal Examination of Sleep Disturbance, Depression and Suicide Risk in Operation Enduring Freedom (OEF) & Operation Iraqi Freedom (OIF) Veterans

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Introduction

- Sleep disturbance is a prominent feature of major depression (Kupfer et al., 1969; Casper et al., 1985; Riemann et al., 2001).
- Moreover, sleep disturbance has been considered a potential means of understanding the underlying pathophysiology of depression.
- Neurocognitive research suggests that depressed individuals experiencing sleep disturbance may suffer from hyperarousal and/or excessive rumination at sleep onset and during sleep (Perlis et. al., 2001).
- Given the well-established link between depression and suicidal behavior, McCall and colleagues (2010) suggested that sleep disturbance, such as insomnia, could be a potential predictor of suicidal ideation.
- Considering Joiner's work (2005) on the paradoxical over-arousal of depressed individuals prior to suicide attempts, the psychological over-arousal associated with sleep disturbance may not only serve as a risk factor for suicidal behavior (Ribeiro, 2012), but may partially explain the link between depression and suicidality.

Present Study

- This study is a prospective examination of the degree to which sleep disturbance mediates the association between depression and suicide risk in male and female veterans.
- Given the established sex differences in depression and suicidal behavior, we explored potential discrepancies in the pathway between depression and suicidality across the sexes.

Hypothesis

- Individuals with depression will have greater sleep disturbances, which in turn will increase their risk for suicidality.

Method

Participants

- 1312 Operation Enduring Freedom/Operation Iraqi Freedom veterans enrolled in Project VALOR (Veterans' After-Discharge Longitudinal Registry)
  - Mean age = 33.6 years (*SD* = 6.2, Range: 22-47 years old)
  - 51.3% female
  - 75.4% White, 16.1% Black, 1.8% Asian, 2.9% American Indian, .7% Pacific Islander, 3% Other

Procedure

- Data were collected at two time points (approximately 1 year apart) as part of a larger study.
- Participants completed a diagnostic interview and self-report questionnaires.
- Self-reported depression and sleep disturbance were measured at Time 1 (T1).
- Suicide risk was assessed via interview at Time 2 (T2).

Measures

	Items	Measured Construct
Patient Health Questionnaire (PHQ)-Major Depressive Syndrome (MDS)	9-items*	Major Depression
Sleep Problem Scale (SPS)	4-items	Sleep disturbance
MINI International Neuropsychiatric Interview-Suicide Module	21-item	Suicidality

*PHQ: Sleep disturbance was not measured as a depressive symptom
- Depression was examined dichotomously
- Sleep Disturbance and Suicidality were examined continuously

Results

- T1 depression was positively associated with both T1 sleep disturbance scores and T2 suicidality scores (see Table 1).
- The correlations remained significant when examining males and females separately (see Table 1).

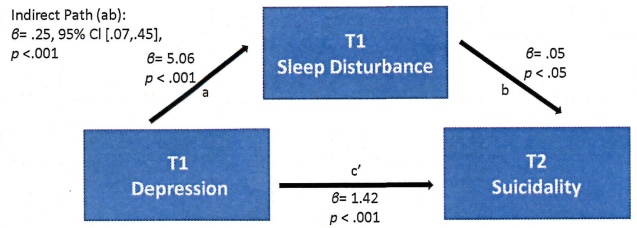
Table 1. Zero order Pearson correlations between depressive symptoms, sleep disturbance and suicidality scores.

	PHQ (Depressive Disorder) T1	MINI Suicidality Scores T2
PHQ (MDS) T1		.21**
SPS (Sleep Disturbance) T2	.15**	.42**
Female Veterans	**PHQ (Depressive Disorder) T1**	**MINI Suicidality Scores T2**
PHQ (MDS) T1		.24**
SPS (Sleep Disturbance) T2	.41**	.16**
Male Veterans	**PHQ (Depressive Disorder) T1**	**MINI Suicidality Scores T2**
PHQ (MDS) T1		.19**
SPS (Sleep Disturbance) T2	.44**	.14**

**$p < .01$

- We tested a mediation model using the PROCESS macro for SPSS 23.0 (Hayes, 2012).
- Among all participants, the indirect path (ab) from T1 depression to T2 suicidality, with T1 sleep disturbances as a partial mediator was significant, β = .25, 95% CI [.07, .45], p <.001 (See Figure 1).
- When examining the sexes separately:
  - Female Veterans: Indirect path (ab) β = .26, 95% CI [.03, .50], p <.001
  - Male Veterans: Indirect path (ab) β = .25, 95% CI [-.05, .55], p >.05

Figure 1



Discussion

- Consistent with the literature, we found that individuals who are depressed are at greater risk for suicidality compared with those who are not. Furthermore, findings suggest that greater sleep disturbance is associated with greater risk for suicidality.
- Sleep disturbance mediated the relation between depression and suicidality in female, but not male, veterans.
- Improving sleep quality may be an important clinical target when attempting to reduce suicide risk in the context of depression.

Study limitations

- The sex differences may reflect methodological limitations of the present study. The MINI captures only certain types of suicidality (e.g. ideation, non-suicidal self injury and attempted suicide) which are more common in females and fails to measure the act of completed suicides, a suicidal behavior more prevalent among men (Mosciciki, 1994).Sleep disturbance was assessed via self –report.

Future directions

- Future studies should incorporate real-time assessment of sleep and arousal.
- Prospective examinations of how depression-specific sleep problems (e.g. insomnia and hypersomnia) may modify this association, particularly in women, are needed.

Project VALOR: Trajectories of Change in PTSD in Combat-Exposed Veterans: W81XWH-12-2-0117

Longitudinal Predictors of Help-Seeking Behaviors in OEF/OIF Veterans

Presented at the Annual Convention of the Association for Behavioral and Cognitive Therapies in Chicago, IL
November 12 – 15, 2015
Presentation time: Friday, November 13th, 10:30am – 12:00pm CST

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National Center for PTSD
Posttraumatic Stress Disorder

Longitudinal Predictors of Help-Seeking Behaviors in OEF/OIF Veterans

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Association for Behavioral and Cognitive Therapies
November 13, 2015

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ADVANCING SCIENCE AND PROMOTING UNDERSTANDING OF TRAUMATIC STRESS

Help Seeking

- Studies to date:
  - Attitudes
  - Intentions
  - Stigma
  - Cross-sectional
- Predicting help-seeking behavior

Bauer et al., 2005; Pietrzak et al., 2009; Stecker, et al., 2007; Vogt, 2011

Research Questions

1. What are veterans' perceived barriers to care?

2. Do these barriers predict future help-seeking behaviors?

Project VALOR

- 1,649 U.S. Army & Marine OEF/OIF combat-exposed veterans in the VA healthcare system
- 50% female
- 75% with two PTSD encounter diagnoses within previous 12 months
- 25% without PTSD diagnosis

Study Design

- Time 1 (T1)
  - Self-report questionnaires
  - Clinician phone interview
- Time 2 (T2) – 2 to 4 years later

Rosen et al., 2012

Participants (N = 1,379)

Age (mean and SD)	33.6 (6.2)
Female (%)	51.2
Race/ethnicity	
Asian (%)	1.8
American Indian (%)	2.9
Black (%)	16.1
Pacific Islander (%)	0.7
White (%)	75.4
Other/unknown (%)	3.1
Hispanic (%)	12.5
Military branch	
Army (%)	90.4
Marine Corps (%)	9.6

Measures

- Barriers to seeking help (T1)
  - Did not know where to find help
  - Concern about military/VA record
  - Distance to care was too far
  - Inadequate transportation
  - Difficult to schedule an appointment
  - Did not think it would help
  - Would harm career
  - Would be too embarrassing

Measures

- Help seeking behaviors (T2)
- Adequate dose
- SCID for DSM-IV (T1)
  - PTSD
- PHQ-9 (T1)
  - Depression

First et al., 2002; Seal et al., 2010; Sheehan et al., 1998

Results

Frequency of Help-Seeking Behavior

	N (%)
Needed but did not seek help at VA	781 (57.0)
Sought help at VA	507 (37.0)
Sought help outside of VA	259 (17.9)
Women's Clinic	8 (3.1)
Behavioral Health Clinic	91 (35.1)
PTSD Clinic	33 (12.7)
Substance abuse treatment	10 (3.9)
Counseling by social worker	54 (20.8)
Counseling by religious figure	43 (16.6)
Marital, relationship, family counseling	47 (18.1)
Self-help (e.g. AA/NA)	15 (5.8)

Perceived barriers to care

Perceived Barriers to Care

Barrier	N (%)
Did not know where to go to find help	80 (5.8)
Concerned about record	121 (7.3)
Distance too far	8 (0.5)
No transportation	5 (0.4)
Difficult to schedule appointment	56 (4.1)
Didn’t think it would help	58 (4.2)
Would harm career	22 (1.6)
Too embarrassing	19 (1.4)

Do perceived barriers to help seeking predict future help-seeking behaviors?

Prevalence of Trauma Types

- At VA
  - Won't help, AOR = .48
  - Career, AOR = .30
- Outside of VA
  - Barriers did not predict
  - Diagnoses did not predict
- Across all settings
  - Career, AOR = .30
  - Embarrassing, AOR = .34

Summary

- Seeking help at VA
- Barriers to care have long-term effect on help-seeking behaviors
- Effectiveness of treatment
- Records, career, embarrassment

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Implications

- Access
  - Physical barriers
    - Infrequently endorsed
    - Did not predict help-seeking behavior
- Stigma
  - Sex differences
  - Targets for outreach efforts
  - Information on records, career impact

Limitations and Future Directions

- PTSD registry
- OEF/OIF Veterans
- Treatment-seeking sample

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